



PG/GB 2003/000046

10/501286



10/501286 PCT/PTO

INVESTOR IN PEOPLE

09 JUL 2004

The Patent Office
Concept House
Cardiff Road
Newport
South Wales
NP10 8QQ

**PRIORITY
DOCUMENT**
SUBMITTED OR TRANSMITTED IN
COMPLIANCE WITH RULE 17.1(a) OR (b)

REC'D 07 FEB 2003

WIPO

PCT

I, the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation & Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as originally filed in connection with the patent application identified therein.

In accordance with the Patents (Companies Re-registration) Rules 1982, if a company named in this certificate and any accompanying documents has re-registered under the Companies Act 1980 with the same name as that with which it was registered immediately before re-registration save for the substitution as, or inclusion as, the last part of the name of the words "public limited company" or their equivalents in Welsh, references to the name of the company in this certificate and any accompanying documents shall be treated as references to the name with which it is so re-registered.

In accordance with the rules, the words "public limited company" may be replaced by p.l.c., plc, P.L.C. or PLC.

Re-registration under the Companies Act does not constitute a new legal entity but merely subjects the company to certain additional company law rules.

Signed

Andrew Gersey

Dated 21 January 2003

Patents Form 1/77

Patents Act 1977
(Rule 16)



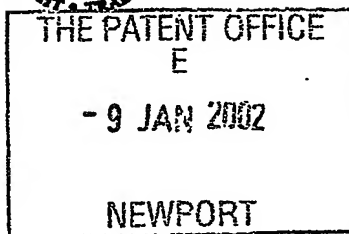
1/77

The Patent Office

Cardiff Road
Newport
South Wales
NP10 8QQ

Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)



1. Your reference

CMD/BP5981923

2. Patent application number

(The Patent Office will fill in this part)

0200480.2

10JAN02 E685835-1 D02823

P01/7700 0.00-0200480.2 09 JAN 2002

3. Full name, address and postcode of the or of each applicant (underline all surnames)
Patents ADP number (if you know it)

7991748001

Food Pro Systems Ltd
Unit 3A Brookleaze Ind Est
Stockwood Vale
Keynsham
Bristol
BS31 2AI

If the applicant is a corporate body, give the country/state of its incorporation

UK

4. Title of the invention

Conveyor Belt Cleaning Device and Methods

5. Name of your agent (if you have one)

MEWBURN ELLIS

"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)

YORK HOUSE
23 KINGSWAY
LONDON
WC2B 6HP

Patents ADP number (if you know it)

109006 ✓

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number

Country

Priority application number
(if you know it)

Date of filing
(day / month / year)

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application

Date of filing
(day / month / year)

8. Is a statement of inventorship and of right to grant of a patent required in support of this request?

(Answer "Yes" if:

a) any applicant named in part 3 is not an inventor, or
b) there is an inventor who is not named as an applicant,

or

c) any named applicant is a corporate body.

See note (d))

~~No~~ Yes

Enter the number of sheets for any of the following items you are filing with this form. Do not count copies of the same document

Continuation sheets of this form 0

Description 12

Claim(s) 0

Abstract 0

Drawing(s) 3 + 3

10. If you are also filing any of the following, state how many against each item

Priority documents 0

Translations of priority documents 0

Statement of inventorship and right to grant of a patent (Patents Form 7/77) No

Request for preliminary examination and search (Patents Form 9/77) No

Request for substantive examination (Patents Form 10/77) No

Any other documents (Please specify) No

11. I/We request the grant of a patent on the basis of this application.

Signature

Christopher Denison

Date

9 January 2002

12. Name and daytime telephone number of person to contact in the United Kingdom

Christopher Denison

0117 926 6411

Warning

After an application for a patent has been filed, the Comptroller of the Patent Office will consider whether publication or communication of the invention should be prohibited or restricted under Section 22 of the Patents Act 1977. You will be informed if it is necessary to prohibit or restrict your invention in this way. Furthermore, if you live in the United Kingdom, Section 23 of the Patents Act 1977 stops you from applying for a patent abroad without first getting written permission from the Patent Office unless an application has been filed at least 6 weeks beforehand in the United Kingdom for a patent for the same invention and either no direction prohibiting publication or communication has been given, or any such direction has been revoked.

Notes

a) If you need help to fill in this form or you have any questions, please contact the Patent Office on 08459 500505.

b) Write your answers in capital letters using black ink or you may type them.

c) If there is not enough space for all the relevant details on any part of this form, please continue on a separate sheet of paper and write "see continuation sheet" in the relevant part(s). Any continuation sheet should be attached to this form.

d) If you have answered 'Yes' Patents Form 7/77 will need to be filed.

e) Once you have filled in the form you must remember to sign and date it.

f) For details of the fee and ways to pay please contact the Patent Office.

FOOD PROCESSING SURFACE CLEANING DEVICE AND METHODS

The present invention relates to devices and methods for cleaning food processing surfaces, particularly conveyor belts, more particularly for the sterilisation and/or removal of visible contamination (e.g. dust, hair, faeces, skin and meat pieces) and non-visible contamination (e.g. bacteria, especially *E. coli*) from conveyor belts during the processing of animal carcasses and other raw meat products in abattoirs and other meat processing plants.

The cleaning of food processing surfaces, such as conveyor belts, is problematic. The use of water to clean areas in which food (especially raw meat) is processed can, if the water is not completely removed, allow bacteria to spread through films or rivulets of residual water and lead to cross-contamination. This is compounded by the difficulties in rapidly drying such surfaces. The use of hot air to dry residual water suffers the problem that any bacteria remaining on the surface are then encouraged to multiply. Moreover, the slats of conveyor belts typically have recesses and overlapping portions, which are hard to dry thoroughly.

Natural drying is slow, and leads to unacceptable down times during food processing if surfaces are cleaned with water during working hours.

Sterilisation using hot air has also been tried with conveyor belts, but again, unless complete sterilisation is achieved (again difficult with recesses and overlaps), the heat merely exacerbates the problem, encouraging

bacterial replication.

Although EU regulations require that surfaces (e.g. conveyor belts) which come into contact with raw meat be
5 sterilised at least every 4 hours, the practical difficulties involved lead to widespread non-compliance. Rather, many surfaces such as conveyor belts are sterilised only overnight, to allow complete sterilisation and complete air drying of the surfaces,
10 without requiring the plant to be shut down during normal operating hours.

An object of the invention is to address these and other problems of cleaning food processing surfaces.

15

The inventor has now surprisingly found that the use of a hot water and vacuum system, similar to that disclosed in his own earlier application PCT/GB01/02279 for the removal of contamination from animal carcasses, can allow
20 good cleaning of conveyor belts and other food processing surfaces, with good removal of residual water.

Although sterilisation of the food processing surfaces is desirable, it is not an essential feature of the
25 invention. For example, the invention may be used for intermediate cleaning, between complete sterilisations. Similarly, complete removal of the cleaning water, though desirable, is not an essential feature of the invention. Indeed, for some applications, 80% removal of the
30 cleaning water may be adequate. Where raw meat is involved, however, at least about 95% removal of the cleaning water is preferred, more preferably at least about 98%.

Accordingly, in a first aspect, the present invention provides a food processing surface cleaning system comprising:

5 a vacuum source;

 a cleaning head, having walls defining a vacuum chamber in communication via a vacuum line with the vacuum source, the vacuum chamber having an open vacuum mouth; and

10 means for supplying a pressurised cleaning fluid via a fluid line to one or more cleaning fluid outlets within the vacuum chamber, the cleaning fluid outlets being directed to spray cleaning fluid towards the vacuum mouth;

15 whereby the vacuum mouth may in use be positioned near or against a food processing surface to allow sprayed cleaning fluid to contact the surface and be removed under vacuum via the vacuum line.

20 Generally, it is preferred to have a slight separation between the cleaning head and the surface being cleaned, both to avoid vacuum locking (which may hinder the removal of cleaning fluid) and to prevent the spreading of contamination by the cleaning head itself.

25

 Preferably the cleaning fluid outlet(s) are configured to spray cleaning fluid towards substantially the entire extent of the vacuum mouth, preferably so that the cleaning fluid washes the internal surfaces of the walls forming the vacuum chamber at the vacuum mouth. This can
30 reduce contamination of the cleaning head itself (with possible contamination of the food processing surface by the cleaning head).

The cleaning head may be fixed in position in the food processing area in which it is used. This is particularly suitable for conveyor belts, where the surface may move past the fixed cleaning head. Alternatively, it may be moveable within a fixed range (e.g. to move relative to a static meat processing surface, such as a table or butcher's block), or may be fully moveable, e.g. to allow cleaning of different meat processing surfaces (e.g. different surface, especially conveyor belts, within the same meat processing plant). For use in cleaning conveyors, it is preferably fixed in position during the cleaning operation.

Food processing surface is to be interpreted as meaning any surface on which food is commonly processed, especially industrially, especially in food processing plants, and may in particular include conveyor belts, tables, butchers' blocks and sandwich processing areas. In particular, the food processing surface may be a surface on which raw meat is processed, but the invention applies also to other foods, e.g. conveyors or other surfaces used in industrial frying, baking or other cooking or food processing operations.

The cleaning fluid is preferably generated by mixing hot water and steam. Usually no other components of cleaning fluid are required, though chemical cleaning agents may be added. Preferably the temperature of the cleaning fluid is sufficient to achieve temperature sterilisation of the food processing surface, i.e. 71.5°C or 72°C or higher. More preferably the temperature of the water is higher than 71.5°C, such that the temperature of the

cleaning fluid in contact with the food processing surface is at least about 71.5°C or 72°C. For example, the temperature of the cleaning fluid in the cleaning fluid supply line and/or when leaving the cleaning fluid outlets may be at least about 75°C, 80°C, 85°C, 90°C, 95°C or 98°C.

In use, the pressure under which the cleaning fluid is supplied to the cleaning fluid outlets will be matched with the vacuum pressure and airflow in the vacuum line, such that the cleaning fluid contacts the food processing surface with sufficient force and in sufficient quantity for the desired cleaning effect to occur, and such that it is substantially entirely removed from the food processing surface via the vacuum line. Suitable cleaning fluid pressures may be in the range of 15 to 50 psi, typically using flow rates of .28 to 50 gallons per hour. Suitable vacuum pressure may be about 5-12, preferably about 8.5 inches of mercury. Suitable air flow in the vacuum line may be about 200 cubic feet per minute.

Hot water and steam are typically available on-site in food processing plants, and the system may be fed from such supplies at plant pressure. Typically, this will be higher than the pressure required at the cleaning head, so the system preferably has reduction valves to reduce the pressure of the hot water and/or steam supplies. However, other hot water and/or steam supplies, such as mobile units, are also contemplated.

Preferably steam and/or hot water are mixed together to form the cleaning fluid. The system preferably has a

control unit for controlling the mixing to achieve the desired cleaning fluid temperature and/or pressure. Such a control unit may be valve operated and may include pressure and/or temperature gauges, especially for the
5 cleaning fluid downstream of mixing.

The system may allow simultaneous operation of a plurality of cleaning heads, having respective cleaning fluid, vacuum and (if applicable, see below) steam lines.
10

The vacuum source is typically an air turbine, and is preferably separated from the cleaning heads by a separator in the vacuum line, to remove the cleaning fluid and debris carried by the cleaning fluid from the
15 airflow in the vacuum line. The separator may be supplemented by one or more filters.

The cleaning head preferably has a generally oblong vacuum mouth. The cleaning head preferably has an
20 elongate vacuum mouth. The larger dimension of the vacuum mouth will henceforth be referred to as its width.

Preferably the cleaning fluid outlet(s) are one or more fishtail nozzles.
25

For vacuum mouth widths of greater than about 5 inches, it is desirable for the vacuum line to be branched, different branches being in communication with the vacuum chamber at different points along the width of the vacuum
30 mouth. With wide vacuum mouths and unbranched vacuum lines, the vacuum pressure at the portion of the vacuum mouth far removed from the vacuum line will be significantly lower than at positions near the vacuum

line, and may be insufficient to remove substantially all the cleaning fluid from the food processing surface.

Where the vacuum line is branched, the branches preferably include valves (e.g. butterfly valves) to
5 allow the vacuum pressure across the different branches to be equalised (or otherwise set as necessary to achieve both adequate cleaning of and adequate removal of cleaning fluid from the food processing surface).

10 The width of the vacuum mouth is preferably at least 5 inches, more preferably at least about 8 inches and may be of any size up to about 800 mm (about 32 inches) or even more, e.g. up to about 36 inches. Generally, the width of the vacuum mouth will be approximately the same
15 as the smaller dimension of the food processing surface intended to be cleaned. In particular, the width of the vacuum mouth may be approximately the same as the width of a conveyor belt intended to be cleaned.

Alternatively, narrower cleaning head could be used. For
20 example a static surface such a table or butcher's block could be cleaned by several passes of a narrower cleaning head; a moving surface, such as a conveyor belt could be cleaned by a plurality of overlapping narrower cleaning heads.

25 Preferably the cleaning head (especially an elongate cleaning head) has a plurality of cleaning fluid outlets, preferably fishtail nozzles, preferably arranged generally in a line, more preferably generally across
30 substantially the entire width of the vacuum chamber.

The cleaning head may comprise at least 2, at least 3, at least 4, at least 5, at least 6, at least 7, at least 8,

at least 9, or at least 10 nozzles. The cleaning head may have up to 20, up to 18, up to 16, up to 14, up to 12, up to 10, up to 8 or , up to 6 nozzles. Each individual combination of these minimum and maximum
5 numbers is specifically contemplated.

Where the cleaning head comprises a plurality of cleaning fluid outlets, these are preferably supplied with cleaning fluid via a branched cleaning fluid supply line.
10 Again, the branches of the cleaning fluid supply line are preferably fitted with valves to allow the cleaning fluid pressure at the different cleaning fluid outlets to be equalised (or otherwise set as necessary to achieve both adequate cleaning of and adequate removal of cleaning
15 fluid from the food processing surface).

The cleaning head may advantageously be positioned at a bend in a conveyor belt, where the slats of the conveyor are maximally separated.

20

The system may comprise means for supplying steam to a manifold on the cleaning head, the manifold having apertures through which steam may in use be directed towards vacuum mouth-defining portions of the walls of
25 the cleaning head. This has been found to allow the temperature of the walls defining the vacuum chamber to reach sterilisation temperature at lower steam pressures than steam jets from nozzles or steam shrouds. Where this feature is present, the walls defining the vacuum
30 mouth are preferably irregular, e.g. slotted, to allow the steam to be withdrawn under vacuum without significantly impinging on the food processing surface, to reduce the likelihood of condensate being left on the

food processing surface.

Particularly for cleaning conveyor belts which have through-holes, the system may comprise an air blower.

5 The mouth through which the air is blown is preferably of dimensions similar to those of the vacuum mouth. The vacuum mouth and air blowing mouth may then be aligned with the belt running therebetween, the air blower assisting in the removal of cleaning fluid from the
10 conveyor belt, by blowing it from the belt towards the vacuum mouth.

Separate cleaning heads may be provided for respective surfaces of a conveyor belt. Such cleaning heads may be
15 aligned, such that both surfaces are cleaned simultaneously, or may be offset.

Embodiments of the invention in its various aspects will now be described in detail, with reference to the
20 accompanying drawings, in which:

Fig. 1 is a side view of a cleaning head of a food processing surface cleaning system according to the invention;

Fig. 2 is a cross-section of a different, wider,
25 cleaning head;

Fig. 3 is a cross-section of a still wider cleaning head.

Shown in Fig. 1, a cleaning head 1 of a carcass cleaning
30 system comprises walls 2, 4, 6 of stainless steel, which define a vacuum chamber 8, having a generally oblong open vacuum mouth 10, approximately 5 inches wide, at one end of the chamber. At its other end 12, the vacuum chamber

is in communication with a vacuum line and vacuum source (not shown).

5 A fishtail nozzle 26 is disposed inside the vacuum chamber, directed towards the vacuum mouth. The nozzle is fed via a cleaning fluid connector 30 mounted on the outside a wall 2 of the vacuum chamber 8, for connection to a cleaning fluid supply line (not shown).

10 The cleaning fluid supply line carries a mixture of hot water and steam from a mixer (not shown) having separate steam and hot water inputs.

In use, the fishtail nozzle sprays the hot water / steam mixture towards the vacuum mouth, where it washes the
15 internal surfaces of the walls of the vacuum chamber, thereby to clean and sterilise them. The sprayed water / steam mixture is drawn back under vacuum into the vacuum chamber (and via the vacuum line into a waste collector), causing the spray to form a plume which substantially
20 fills, and protrudes beyond, the vacuum mouth. This is achieved by suitable shaping of the aperture in the fishtail nozzle, and suitable adjustment of water pressure, vacuum pressure and airflow.

25 The vacuum mouth is positioned near a food processing surface, e.g. conveyor belt 40, such that the plume of spray protruding beyond the vacuum mouth impinges on the surface with a scrubbing action, which is highly effective at loosening and sterilising visible and non-
30 visible contamination, which is carried into the vacuum chamber and into the waste collector along with the water.

In this embodiment, where the cleaning head is fixed in position relative to the conveyor belt, the vacuum mouth is prevented by the fixings from vacuum locking against the conveyor belt. In other embodiments, this may be
5 achieved by providing a non-straight (e.g. slotted) edge to the vacuum mouth.

Controls (not shown) are provided in the system for adjusting pressure, temperature and airflow in the
10 vacuum, steam and hot water lines.

Shown in Fig. 2 positioned over a conveyor belt 40 (shown in cross section) is a wider cleaning head 101. This cleaning head is generally similar to that shown in Fig.
15 1, the main difference being that the vacuum line 150 is branched, the two branches 152, 154 connecting with side walls 106 of the vacuum chamber 108. Butterfly valves (shown schematically as 156) allow the vacuum pressure in the two branches to be equalised. This arrangement
20 reduces the problem of reduced suction that would be encountered near the side walls 106 if only a single vacuum line were connected to the vacuum chamber.

In this embodiment, the cleaning fluid connector is
25 linked via a branched tube 158 to 3 fishtail nozzles 26 arranged linearly along the width of the cleaning head. Valves (shown schematically as 160) in the branches allow the cleaning fluid pressure at the different nozzles to be equalised, or otherwise set as desired.

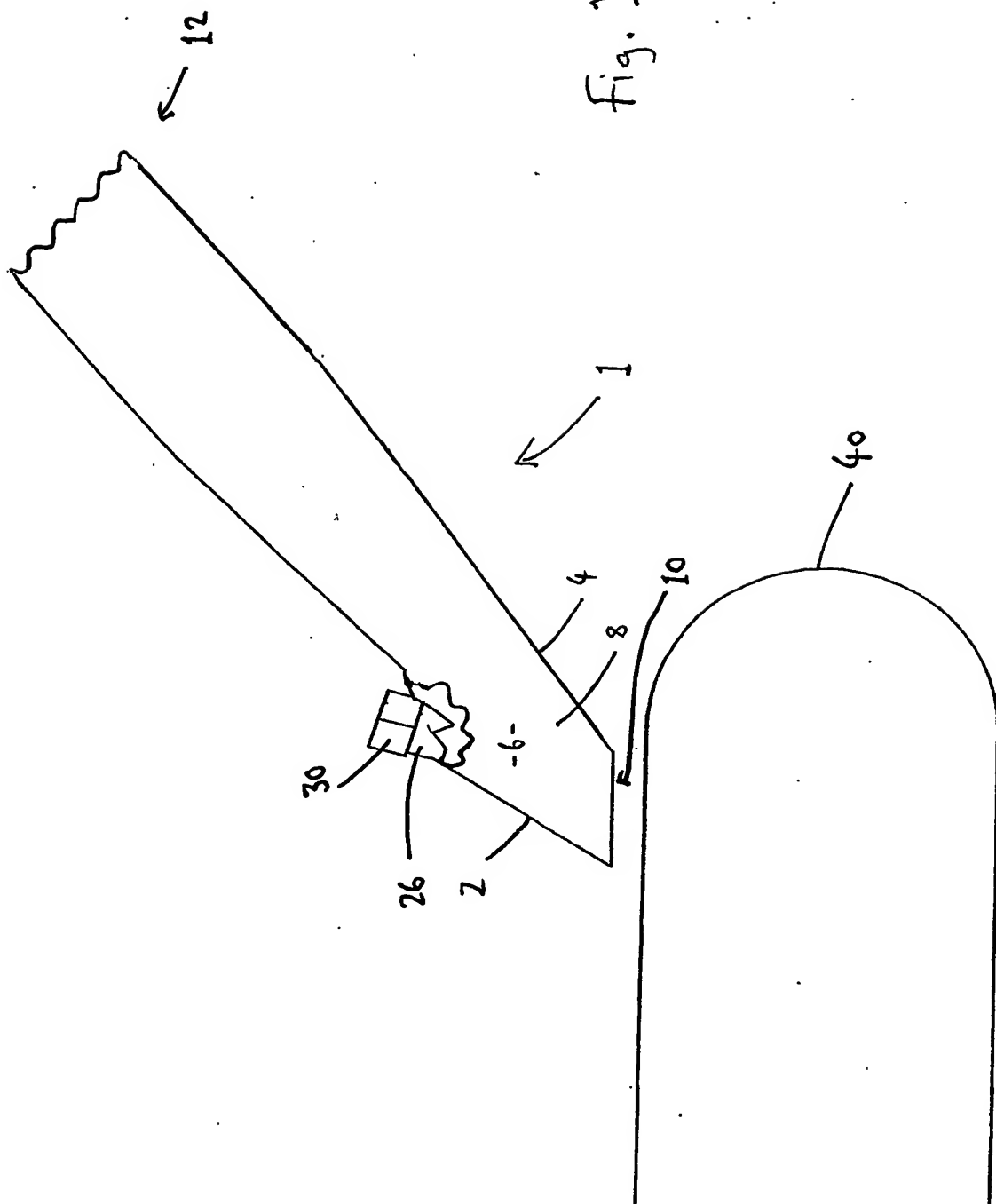
30

Shown in Fig. 3, a still wider cleaning head, has a three-way branched vacuum line 250. Again the three branches 252, 254, 255 are fitted with butterfly valves

(shown schematically as 156). The cleaning fluid connector 30 is linked via a branched tube 258 to 5 fishtail nozzles 26. Again, valves (shown schematically as 160) in the branches allow the cleaning fluid pressure at the different nozzles to be equalised, or otherwise set as desired.

1/3

Fig. 1



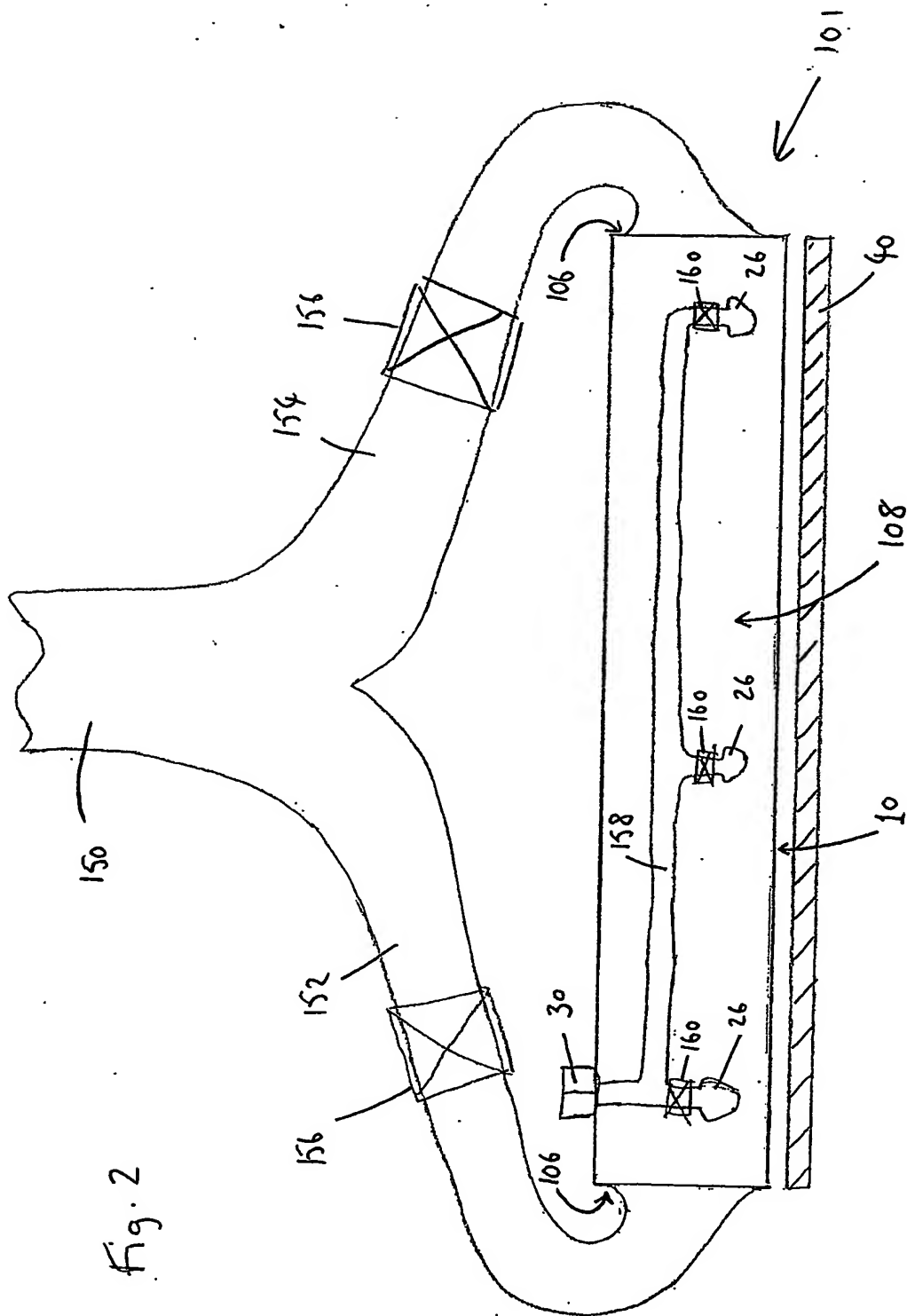


Fig. 2

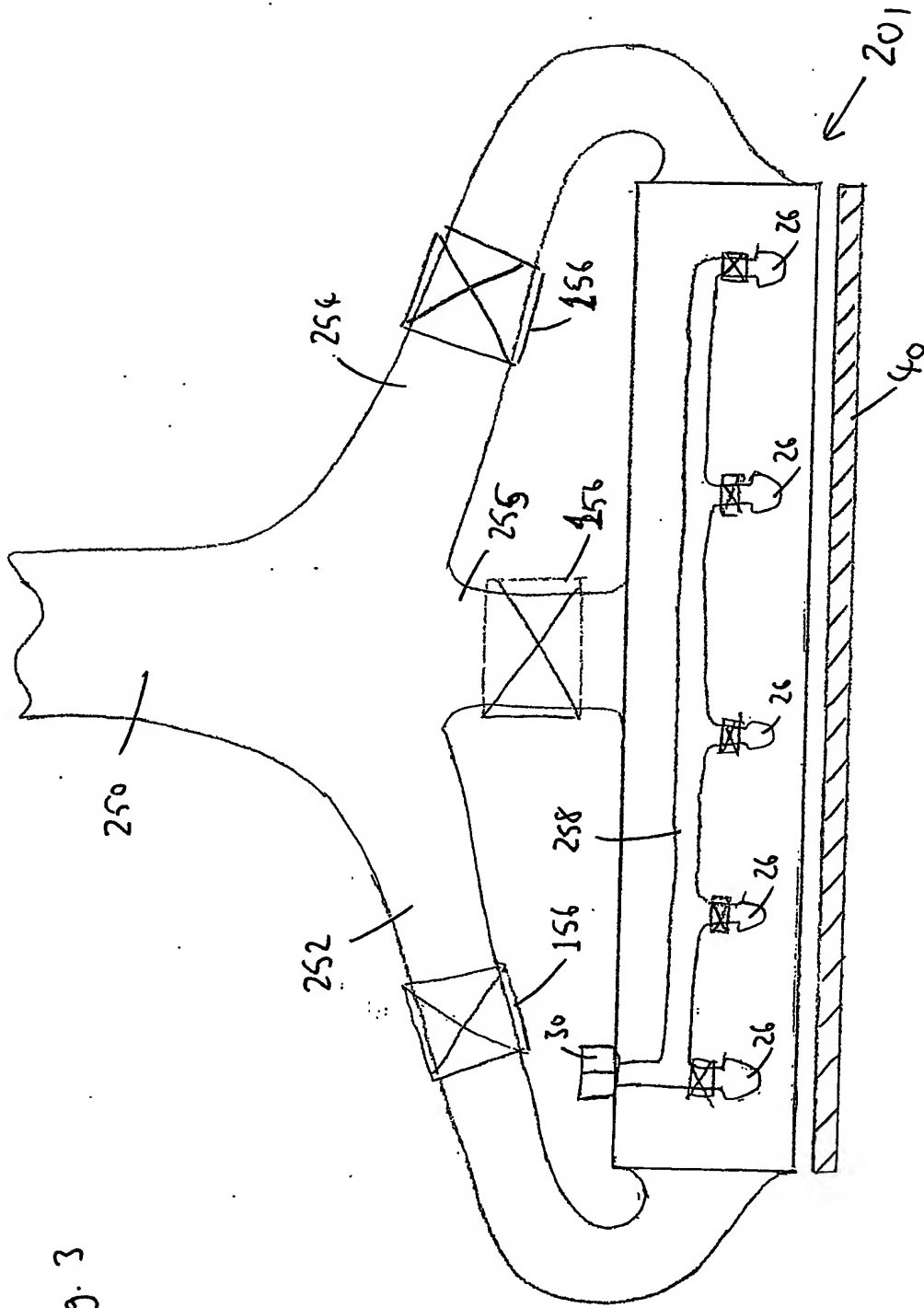


Fig. 3